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Abralia marisarabica, a New Enoploteuthid Squid from the Arabian Sea (Cephalopoda: Oegopsida)

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The squids of the genus *Abralia* GRAY 1849 (Family Enoploteuthidae) are small species living in epi- to mesopelagic life in the tropical to temperate oceans. Up to this date, fifteen nominal species have been known:

- Atlantic: *A. veranyi* (RÜPPELL, 1844) [Tropical, East & West],
A. redfieldi VOSS, 1955 [Tropical to temperate, North to South],
A. grimpei VOSS, 1958 [Northwest] and
A. siedleckyi LIPÍŃSKI, 1983 [South].
- Pacific: *A. armata* (QUOY & GAIMARD, 1932) [Tropical, West],
A. sparki GRIMPE, 1913 [Philippines],
A. astrolineata BERRY, 1913 [Kermadec],
A. lucens VOSS, 1963 [Tropical, Northwest to South-Central],
A. astrosticta BERRY, 1909 [Tropical, West to Central],
A. trigonura BERRY, 1914 [Hawaii],
A. multihamata SASAKI, 1929 [Taiwan] and
A. japonica ISHIKAWA, 1929 [Japan].
- Indian Ocean: *A. steindachneri* WEINDL, 1912 [Red Sea] and
A. renschi GRIMPE, 1931 [Sumatra].
- Indo-Pacific: *A. andamanica* GOODRICH, 1896 (+subsp.).

During an exploratory fishing conducted by the R/V *Shoyo-Maru* in the Arabian Sea during December 1976, a midwater trawl hauled a large swarm of small squid and Myctophid fish. This particular catch contained a large number of unnamed squid belonging to the genus *Abralia*. The description of this new species is given below.

I wish to express my gratitude to Dr. H. YAMANAKA, Far Seas Fisheries Research Laboratory, and Dr. I. NAKAMURA, University of Kyoto, for their generous offering squid specimens under my disposal. Thanks are also due to the crew of the R/V *Shoyo-Maru* for their cooperation with scientists on board in collecting such an interesting biological sample. Detailed measurements and illustrations were executed with cooperation of Mr. K. YAGISAWA, Tokai University, for whom I owe thanks.

Family ENOPLOTEUTHIDAE Pfeffer, 1900

Subfamily Enoploteuthinae Pfeffer, 1912

Abralia marisarabica n. sp.

Material examined: Over 100 specimens collected at 24°48'N, 63°20'E (December 2, 1976) by a mid-water trawl from a depth of 110 m.

Description: The mantle is short conico-cylindrical ending in a blunt end of a short tail. The mantle width is about 40 to 50% of the mantle length. The antero-dorsal end forms an obtuse angle in the middle, while antero-ventral margin is broadly emarginated leaving a blunt angle on both sides.

The fins are transversely broad, sagittate in outline with blunt lateral angles, wider than long. The fin length at the base is about 40–45% of the mantle length, while the broadest width attains about equal or slightly smaller than the mantle length.

The head is subcubic in shape, narrower than the mantle opening with moderate eyes on the lateral sides. There are two pairs of low nuchal crests, one is the pronounced posterior rim of the funnel groove and the other is located just behind the eye. The funnel is proportionally large. The funnel groove is broad corresponding

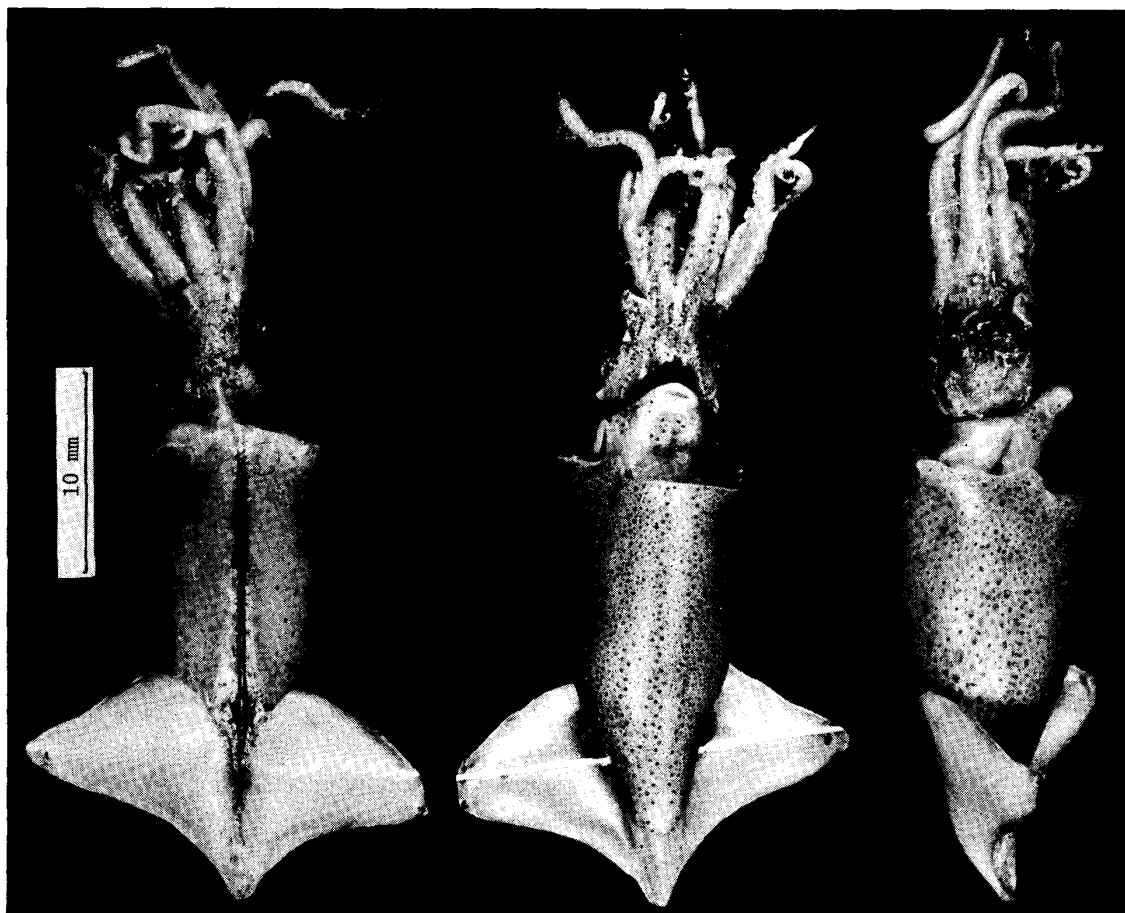


Fig. 1. *Abralia marisarabica* n. sp. — Three views of the Paratype No. 1.

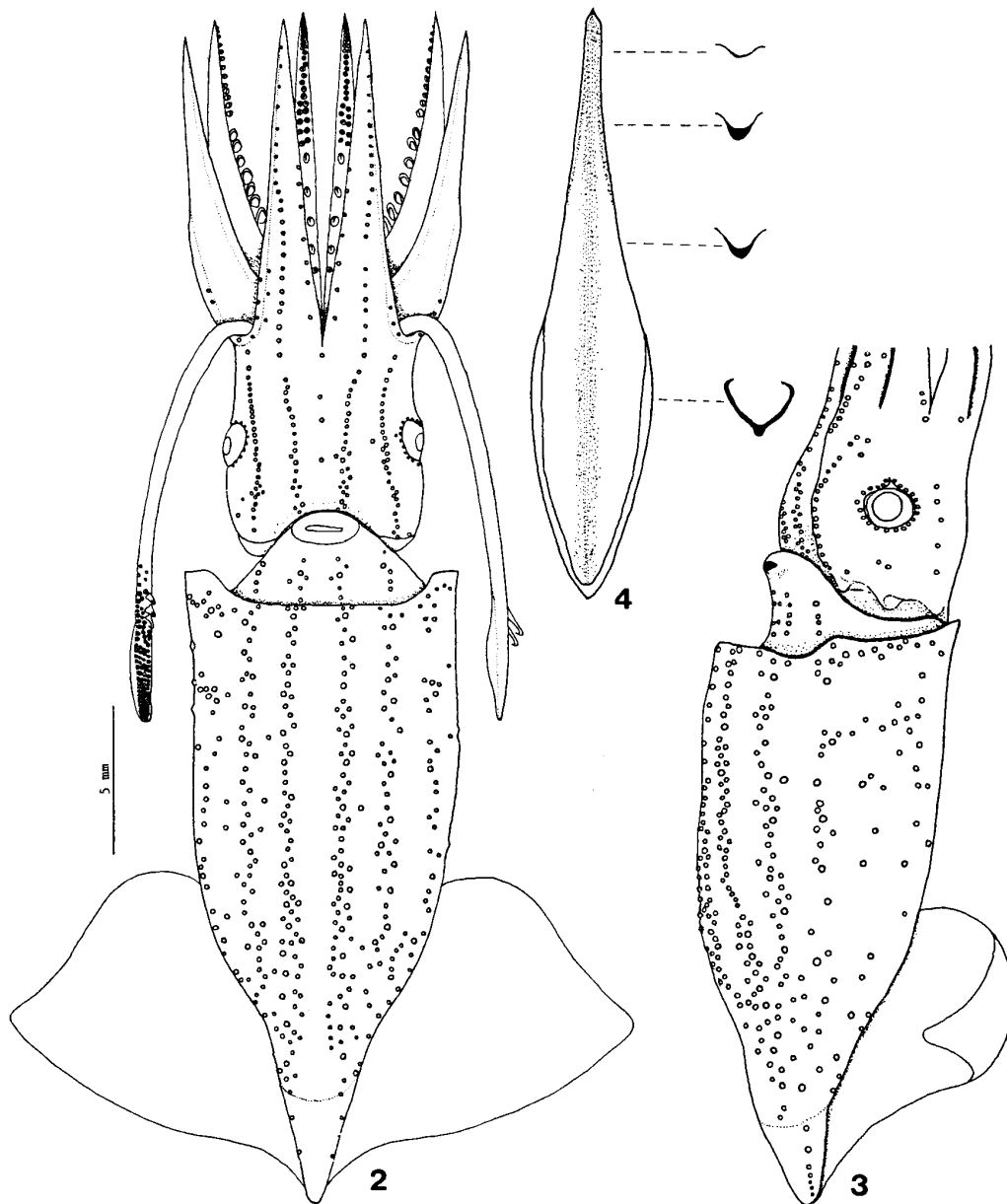
to the large funnel, but the anterior border is not always very clearly demarcated off. The funnel component of the funnel-mantle connective is simple leaf-shaped, with a shallow groove in the middle. The mantle component of the same is a short, slender ridge. The nuchal cartilage is spatulate and widened anteriorly carrying a broad central longitudinal ridge which has a shallowly grooved top. The dorsal element of the funnel organ is V-shaped, with oval rami and a delicate papilla at the anterior end. The ventral pad is subtriangularly oval in outline. The eye lid has a shallow but distinct sinus in front.

Arms are nearly equal in length, rather short in comparison to those of other members of the genus. The Arms I and II have neither aboral keel nor protective membrane. The Arm III has a moderate aboral keel and protective membrane. The low aboral keel of the Arm IV is a web at the proximal end of the tentacle. Armatures of all arms composed of proximal suckers (0 to 4, mostly 2 or 3), medial hooks (5 to 10 in male and 7 to 13 in female) and distal suckers (12 to 33 except on the modified portion of the hectocotyliized arm). The right Arm IV of the male is hectocotyliized. In the hectocotyliized arm, there are no distal suckers but a pair of offset fleshy crests of which the ventral one is larger than the dorsal one and has a shallow concavity on the top.

The tentacles are rather weak attaining mostly 70 to 100% of the dorsal mantle length with ample variability. The tentacular stem is totally naked. The club is not much widened and with no flap or crest except for the aboral membrane near the distal end. The carpal members composed of 5 suckers and very low, indistinct pads, probably 4–5 in number. They are so obsolete that no demarcation of the fixing apparatus is recognized. The manus has 15–16 suckers and 2 or 3 hooks arranged in a row ventrally. The chitinous rings of suckers have minute but sharp teeth. The dactylus suckers are arranged in approximately 4 rows, about 70 in number.

The whole surfaces of the ventral mantle, funnel, head and Arms III and IV are ornamented with photophores. Photophores are composed of two different types, large and small, and the former is far sparser than the latter. On the ventral mantle, photophores are arranged in approximately 6 longitudinal rows of which medial 4 are less diffused than the lateral ones. There is a wide mid-ventral strip between two ventralmost rows. Photophores on the funnel are arranged following the pattern of the ventral mantle leaving a rather wide space between adjoining rows. On the ventral head, there are 2 major rows. One starts from the anterior end of the funnel groove continuing up to the distal end of the Arm IV. Another one runs almost in parallel to the former margining the rim of the eye and reaching to the posterior portion of the Arm IV. There are considerable number of photophores interposed among them and the mid-ventral row seems to be divided into two hemmed the ventral margin of the Arm IV. There are few grouped photophores on the proximal portion of the Arm III, which may be a continuation of the sparse group on the dorsal margin of the eye. There are 21–22 small light organs bordered the orbit of the eyelid.

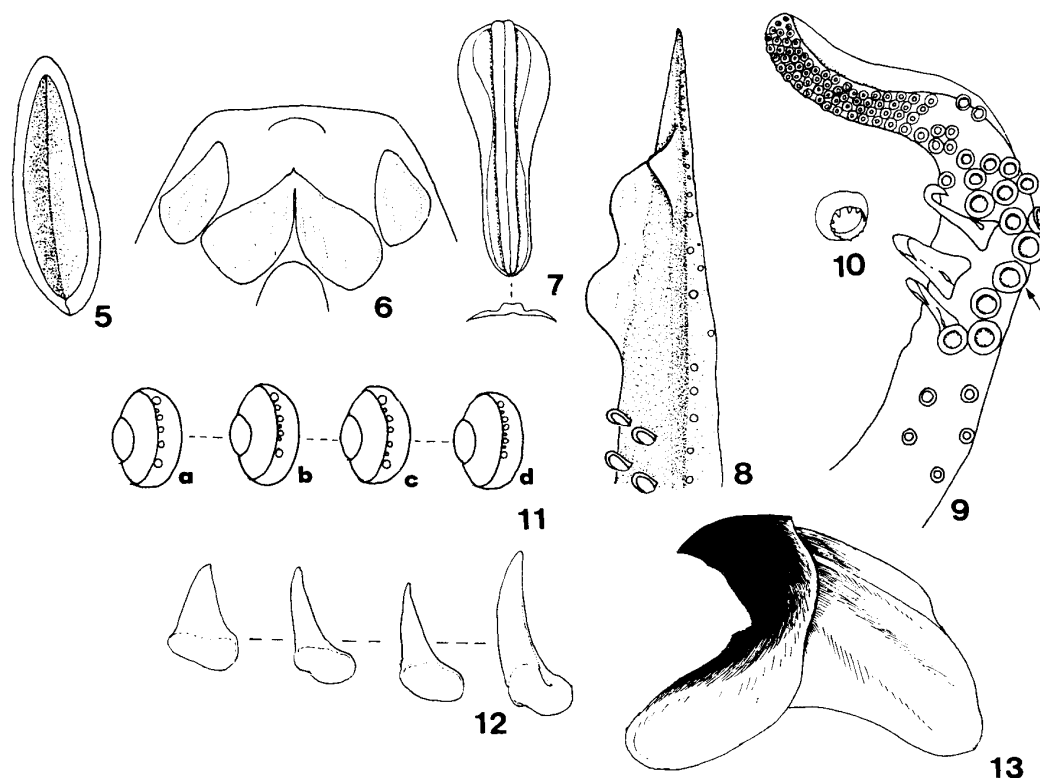
There are variabilities in size composition and numbers in subocular photo-



Figs. 2-4. *Abralia marisarabica* n. sp. — 2. Ventral view of the Paratype No. 1 showing the photophores on the ventral surface. — 3. Latero-ventral view of the mantle-head part of the same specimen. — 4. Galdius.

phores. So far examined, the minimum number of ocular photophores is 5 with composition of LMMML. But, small photophores are arbitrarily interposed among them and make the total number up to 8 (such as LSMSMSML or LSMSMMSL etc.). The shape of all types of subocular photophores is always round, and no elongate type exists.

The buccal membrane is pale purplish and attaches to the dorsal side of the Arm



Figs. 5–13. *Abralia marisarabica* n. sp. — 5. Funnel component of the mantle-funnel connective. — 6. Funnel organ. — 7. Nuchal cartilage with its transverse section. — 8. Modified portion of the hectocotylized arm. — 9. Right tentacular club. — 10. Chitinous ring of a tentacular sucker (indicated with an arrow in fig. 9). — 11. Variabilities of subocular photophores; a. LSMMML, b. LMMSMSL, c. LSMMMML, d. LSMMSMSL. — 12. A half row of the radular teeth. — 13. Lower jaw plate.

IV. The radular teeth are 7 per row and all have rather blunt tips. The outer marginal tooth is the highest of all.

The lower jaw plate is darkened gradually without spot or hook-like staining. The jaw edge is not straight but has a slight notch. The hood is slightly shorter than the crest length, and has a shallow notch behind. The shoulder has a low ridge and small semilunar crest below the jaw angle. The wing is rather narrow and transparent except for the shoulder area. The crest is round and rather narrow. A weak fold runs on the lateral wall and there seems to be an additional swelling below that.

The gladius is typical for the family, but the vane is strongly depressed medially.

Type series: Holotype specimen (NSMT Mo-31359): Matured male, 20.0 mm in DML; Paratype No. 1 to No. 4 (NSMT Mo-31360 a-d): 4 males, 20.4–21.7 mm DML; Paratype No. 5 to No. 9 (NSMT Mo-31361 a-e): 5 females, 22.0–25.5 mm DML. All collected from 24°48'N, 63°20'E by the R/V *Shoyo-Maru* on December 2, 1976.

Measurements: See Table 1.

Table 1. Measurements, indices and counts in

Holotype					
Sex	Male	Male	Male	Male	Male
DML	19.0 mm	20.0 mm	21.7 mm	20.4 mm	20.5 mm
MWI	53.7	50.1	42.4	42.2	46.3
FLI	48.4	41.0	39.6	39.2	42.4
FWI	102.1	110.0	84.3	84.3	67.8
HWI	38.4	32.0	26.7	29.9	30.7
ALI* I	62.1	50.1	55.8	46.1	55.1
II	63.6	68.5	56.2	59.3	62.0
III	64.2	63.0	52.5	45.6	62.4
IV	66.3	73.5	59.0	50.0	63.4
HcLI	15.7	14.0	11.0	11.7	11.2
TLI*	72.1	170.0	77.4	74.0	94.6
CLI*	22.1	25.0	18.4	16.7	17.6
Arm sucker (& hooks)**					
I	3+(9)+33	3+(8)+16	3+(8)+15	4+(5)+22	3+(8)+15
II	2+(9)+34	3+(8)+12	3+(7)+17	4+(7)+17	3+(9)+17
III	2+(9)+29	1+(10)+16	3+(8)+15	3+(8)+12	2+(8)+14
IV	0+(9)+0	0+(7)+0	2+(10)+0	2+(9)+0	3+(9)+0
Tentacular hooks***	2	2	2	2	2
Subocular photophores****					
{Right	LMMMSL	—	LSMMSMSL	LMMML	LSMMSML
{Left	LMMMSL	LSMSMMSL	LMMMSL	LMMML	LSMMSML

* Arm length index, tentacle index and tentacular club index for the right side; ** From proximal to distal, numerals in parenthesis indicate number of hooks otherwise suckers; *** For right tentacle; **** L for large, M for medium and S for small.

Comparison and relationships: This is a small species of the genus *Abralia*, male has mature spermatophores in the spermatophore sac at 20 mm in mantle length. Female is 10 to 20% larger than male in dorsal mantle length. A slight difference in counts of arm hooks may be another sexual dimorphism. The species is characterized by having 5 basic photophores on the eyeball occasionally with 1–3 small organs arbitrarily interposed, 2 tentacular hooks (very occasionally 3) and proximal suckers on all arms. The mantle is short with rather large MWI and the fins are proportionally broad. Only a few species within this genus have MWI and FWI exceeding those in the present new species (*Rf.* Table 2 of OKUTANI, 1972).

The number of tentacular hooks is one of the consistent characters. The species which have 2 tentacular hooks hitherto known are only two species, *A. japonica* and *A. grimpei*. However, these two species are separable from the *A. marisarabica* n. sp. in the following points:

A. japonica ISHIKAWA, 1929 is more than twice larger than this species (56 mm ML) and has 5 similar-sized subocular photophores. The males in the present material are proved to be sexually matured, but it is not certain if ISHIKAWA's species matures

Abralia marisarabica n. sp.

Female	Female	Female	Female	Female
24.0 mm	25.5 mm	22.0 mm	24.3 mm	23.7 mm
40.0	43.9	51.3	43.2	46.4
44.1	41.5	44.5	46.5	43.0
83.3	86.2	101.8	86.4	70.9
26.3	27.1	33.6	24.6	26.2
42.1	43.1	58.2	48.5	48.5
45.8	44.7	58.6	52.6	63.3
45.0	49.0	55.9	46.9	62.0
58.3	49.0	62.7	56.0	57.8
—	—	—	—	—
69.2	65.5	125.0	94.2	103.4
20.0	19.6	23.6	20.5	19.4
1+(13)+17	3+(8)+14	2+(10)+15	3+(10)+17	2+(9)+16
1+(12)+16	3+(12)+21	2+(10)+22	1+(13)+23	2+(10)+22
2+(11)+12	3+(8)+17	1+(9)+12	2+(11)+22	2+(10)+15
0+(12)+12	4+(7)+16	1+(10)+15	1+(13)+12	2+(12)+19
3	3	2	2	2
LSMMSMSL	LSMSMMSL	LSMMMMSL	LSMSMSML	LSMSMMSL
LSMMSMSL	LSMMMMSL	LSMMMMSL	LSMMMMSL	LSMMMMSL

at this size.

An Atlantic species, *A. grimpei* Voss, 1958 is a medium-sized species (34 mm ML) among the genus. The general characters are very close to the present new species, particularly not only the numbers of tentacular hooks but also condition of subocular photophores (6–7). However, *A. grimpei* has no proximal suckers on arms, less numbers of distal suckers on arms, keels on the Arms I and II, and carpal flap on the tentacle.

Among the *Abralia* species possessing 3 tetnacular hooks, *A. redfieldi* Voss, 1955 has different type of hectocotylus which consists of 3 fleshy crests. Two other Atlantic species, *A. veranyi* (RÜPPELL, 1844) (hooks 3–4) and *A. siedleckyi* LIPÍŃSKI, 1983 (hooks 3) share with the present new species in having 5 subocular photophores, but one (in *A. siedleckyi*) or two (in *A. veranyi*) of terminal photophores are opaque and creamy extra large organs different from other components.

Indian Ocean species, *A. andamanica* GOODRICH, 1896 is not likely sympatric with *A. marisarabica* n. sp. (although there has no direct evidence). But, it is consistently has 5 subocular photophores, in spite of the fact that there is considerable

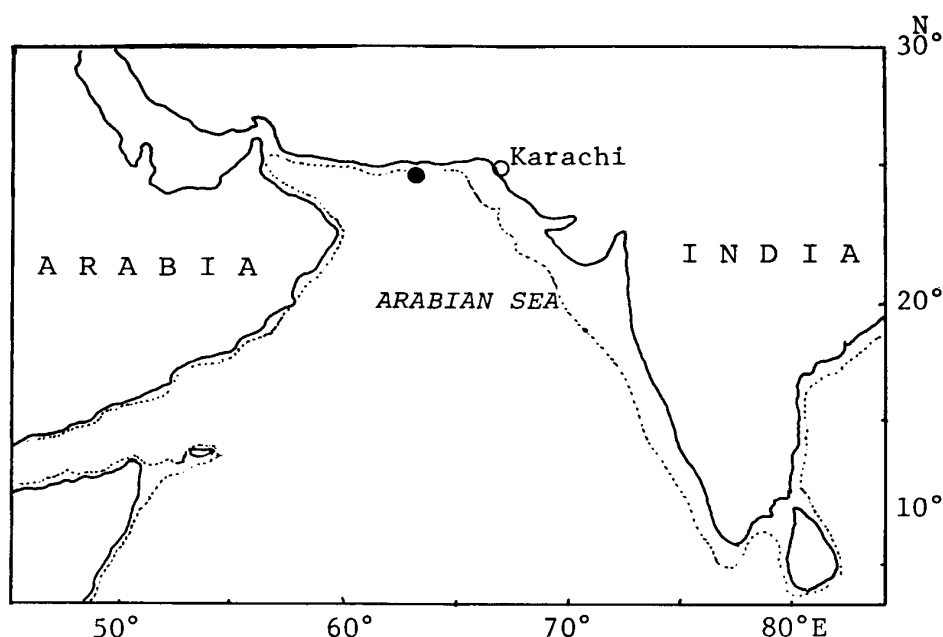


Fig. 14. Type locality (solid dot) of *Arbalia marisarabica* n. sp.

variabilities in size and shape (KUBOTA, IIZUKA and OKUTANI, 1982) and has never interposed organs.

Other members of the genus *Abralia* having more than 3 hooks on the tentacle may not be needed to be compared.

Pacific species, such as *A. armata* (QUOY & GAIMARD, 1832), *A. sparcki* GRIMPE, 1931 and *A. lucens* VOSS, 1963 have some interposed small organs among subocular photophores. The variabilities of these organs for those species are not clear at present. The arbitrary interpose of small organs that cause a large range of number of subocular photophores (5 to 8) may be one of peculiarity of *A. marisarabica* n. sp.

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